

## **GOLF CLUB HAVING STEPPED GROOVES**

### **BACKGROUND OF THE INVENTION**

[0001] The striking face of most golf clubs, and particular golf club irons,  
5 contains a plurality of parallel grooves to provide a more consistent spin to the golf ball when struck. More consistent spin allows for more consistent shots. With short irons, the more consistent shots also enable the skilled golfer to control the landing of a golf ball on the green.

[0002] The United States Golf Association ("USGA") has set certain  
10 standards for grooves in a golf club. Specifically, the grooves must be straight, have diverging sides, and have a symmetrical cross-section. The width, depth, and spacing of the grooves are also set forth in the USGA standards.

[0003] The present invention relates to a stepped or serrated groove  
configuration for golf club heads which conforms with USGA standards and also  
15 improves the consistency of the club.

### **BRIEF DESCRIPTION OF THE PRIOR ART**

[0004] Various groove configurations for golf club heads are known in the  
prior art. For example, the Chappel U.S. published patent application No.  
2002/0042306 discloses a golf club with modified grooves which increase the  
20 backspin on a struck golf ball. In one embodiment, an angled slot groove configuration includes a chamfered edge and three separate surfaces. Other  
embodiments include Y-shaped grooves and angled slot grooves with double

chamfered surfaces. In the Rife U.S. patent No. 5,618,239, there is disclosed a putter having grooves of angled or trapezoidal configurations.

**[0005]** While these types of grooves, as well as conventional square or V-shaped grooves with straight side walls, perform satisfactorily, there is a limit as to the consistency of spin that they can impart to a golf ball because of the limited edges of the grooves that contact the ball. The present invention was developed in order to overcome these and other drawbacks of the prior art by providing a golf club with stepped or serrated grooves which comply with USGA standards.

#### SUMMARY OF THE INVENTION

**[0006]** Accordingly, the present invention relates to a golf club head including a body having a striking face portion containing a plurality of spaced, parallel grooves. The grooves are defined by a pair of opposed diverging side walls extending from within the body to the striking face portion. At least one side wall contains at least one step portion so that the grooves have a stepped configuration.

15 Preferably, both side walls contain a step portion

**[0007]** The grooves have an axis which extends normal to the striking face portion and through the mid-point at the bottom of the groove. The side walls on opposite sides of the groove axis are symmetrical.

**[0008]** The grooves may have a V-shape or a U-shape. The V-shaped grooves have side walls which intersect at the bottom of the grooves. The U-shaped grooves have side walls that terminate at opposite ends of a bottom wall which preferably is parallel to the striking face.

[0009] The step in each groove side wall divides, the side wall into first and second portions. These portions can be parallel but need not be.

#### BRIEF DESCRIPTION OF THE FIGURES

[0010] Other objects and advantage of the invention will become apparent  
5 from a study of the following specification when viewed in the light of the accompanying drawing, in which:

[0011] Fig. 1 is a front plan view of a golf club head incorporating grooves according to the invention; and

[0012] Figs. 2-6 are cross-sectional views of grooves having different  
10 configurations in accordance with different embodiments of the invention, respectively.

#### DETAILED DESCRIPTION

[0013] In Fig. 1 is shown a golf club head of the iron type. The head includes a body 2 having a hosel 4, a toe portion 6, a heel portion 8, and a striking  
15 face portion 10 containing a plurality of straight, parallel, spaced grooves 12. While the invention is directed toward grooves for an iron type golf club head, the grooves may also be provided in wood type club heads or in putter heads.

[0014] Referring to Fig. 2, a cross section of a groove 12 according to a preferred embodiment is shown. The groove has an axis A which extends normal to  
20 the striking face portion 10 through the middle of the groove bottom wall 14. On

opposite sides of the axis, the groove is defined by side walls 16, 18 which diverge from within the club head body 2 toward the striking face portion 10.

[0015] The side wall 16 contains at least one step portion 16a which divides the side wall into first 16b and second 16c portions. Similarly, the side wall 18 contains at least one step portion 18a which divides the side wall into first 18b and second 18c portions. Preferably, the first and second portion 16b, 16c of the side wall 16 are parallel. That is, they are arranged at the same angle  $\alpha$  relative to the axis A. Similarly, the first and second portions 18b, 18c of the side wall 18 are also parallel and arranged at the same angle  $\alpha$  as the side wall 16 so that the walls are symmetrical. The general configuration of the groove 12 is a U-shape.

[0016] In Fig. 3 is shown a second embodiment of a V-shaped groove 112. In this embodiment, the side walls 116 and 118 intersect at the bottom of the groove. Thus, there is no flat bottom wall in the groove as there is with the groove 12 of Fig. 2. The side walls 116, 118 each contain a step 116a, 118a so that the groove is stepped. The first and second portions 116b, 116c; 118b, 118c of the respective side walls are arranged at the same angle  $\beta$  relative to the axis.

[0017] Fig. 4 illustrates a third embodiment for a stepped groove 212 according to the invention. As compared to the groove in Fig. 2, the angle  $\Delta$  between the side walls 216, 218 and the axis is less than the angle  $\alpha$  of Fig. 2. This results in a groove with a wider bottom wall. Steps 216a and 218a are provided in the side walls 216, 218, respectively.

[0018] In the embodiment of Fig. 5, a serrated groove 312 is defined by side walls 316, 318 having steps 316a, 318a, respectively. In this embodiment however,

the first and second portions 316b, 316c of the side wall 316 are not parallel. Rather, the angle x between the first wall portion 316b and the axis A is greater than the angle y between the second wall portion 316c and the axis A. Similarly, the angle x between the first wall portion 318b and the axis A is greater than the angle y between the second wall portion 318c and the axis A. Alternatively, the angle y could be greater than the angle x.

**[0019]** From these embodiments, it is apparent that a variety of stepped groove configurations can be defined by various stepped side walls. The step in the walls can be arranged anywhere along the length of the wall, although it is preferable to arrange it higher or closer to the striking face surface.

**[0020]** When a ball is struck by a club head incorporating stepped grooves according to the invention, the cover of the ball is caught by the edges of the grooves. These edges include the area where the side walls meet the striking face surface and the area adjacent to each step. Thus, a greater surface area of the ball is caught by the grooves of the invention to impart more consistent spin on the ball.

**[0021]** While the invention has been described as conforming with USGA standards, the principles thereof can be applied to non-conforming clubs. Thus, the axis A of the grooves need not be normal to the striking face of the club head body. The side walls can be arranged normal to the striking face, rather than diverging, to define square grooves.

**[0022]** If desired, a step or steps need only be provided in one of the groove side walls. In Fig. 6 is shown such a groove 412. The side wall 416 contains at least

one step portion 416a, whereas the side wall 418 is linear. The angles between the side walls 418 and the axis A can be equal or they may be different.

**[0023]** It is preferable for all of the grooves on the club to have the same configuration. However, it is possible to provide differently configured grooves across the club face. For example, stepped grooves can be provided toward the sole of the club with non-stepped grooves toward the top.

**[0024]** Testing of a golf club of the sand wedge type incorporating stepped grooves as shown in Fig. 2 has been conducted to determine the effect of the stepped grooves on the backspin of a struck golf ball relative to a ball struck by a conventional sand wedge.

**[0025]** In Table 1 are set forth the test results for a sand wedge according to the invention striking a golf ball 12 times under controlled conditions.

	Launch Angle	Ball Speed	Back Spin
Average	26.7	130.3	10438
StDev	0.30	0.49	199
Min	26.0	129.4	10018
Max	27.3	131.3	10854
Count	12	12	12

**Table 1**

**[0026]** In Table 2 are the test results for a conventional sand wedge such as a BEN HOGAN® 5612 sand wedge

	Launch Angle	Ball Speed	Back Spin
Average	27.4	128.6	10434
StDev	0.34	0.47	246
Min	26.7	127.9	10192
Max	27.9	129.2	11047
Count	12	12	12

**Table 2**

[0027] Finally, means (t) and variability (F) tests were conducted to determine the probability that the stepped groove club differs from the conventional club and the probability that the variation is less than in the conventional club, respectively. Those results are shown in Table 3.

	Launch Angle	Ball Speed	Back Spin
t-Test	100.0%	100.0%	51.7%
F-Test	66.5%	*	75.2%

\* denotes that conventional club has less variation

**Table 3**

[0028] The test results indicate that the probability that either club spins the ball more than the other club is 51.7%. That is, the spin differential between the clubs is small enough as to be insignificant. However, the variability test results show that the stepped groove club is more consistent than the conventional club 75.2% of the time.

[0029] While the preferred forms and embodiments of the invention have been illustrated and described, it will be apparent to those of ordinary skill in the art, that various changes and modifications may be made without deviating from the inventive concepts set forth above.